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PRELIMINARY INSTRUCTIONS FOR THE REDUCTION OF THE MAP OF THE USSR, SOVIET 1:500,000

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[With the exception of Appendix 7, appendices referred to herein are not reproduced, but are available in the original document at CIA.]

PREFACE TO THE GERMAN TRANSLATION

The "Instructions" published in March 1940 are of interest to the German reader for two reasons.

The Russian Atlas 1:500,000 is almost entirely of recent, partly of very recent, date. It is intended by the Russians to be the basic atlas, since complete representation of the USSR on a larger scale will be out of the question for a long time. It should also replace the totally inadequate and outdated 10-Verst Map (1:420,000), of which some sheets are still in use, as soon as possible. The Russians have succeeded in a few years in representing all of European Russia and considerable portions of Asiatic Russia on the scale of

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1:500,000. The individual sheets, except for a few which represent border areas in a dated and irregular manner, are of excellent cartographic quality, and naturally have been of importance in working out our military maps. It is therefore desirable to be well informed concerning the basic viewpoints underlying the production of the 1:500,000 map.

From another viewpoint, the "Instructions" should be considered as an attempt to prepare a comprehensive set of cartographic working directions, the basic application of which would seem desirable when many persons are working simultaneously at putting out a set of maps depicting Russian territory.

In general, the "Instructions" seek to follow the right course of not permitting the number of directions to become too large. On the other hand, sufficient directives are given to maintain unity of work, for example, in the matter of inscription, etc. The many sheets which appeared in the years 1940, 1941, and 1942 prove by their technical excellence and uniformity that the "Instructions" (which certainly were preceded by similar working directions) accomplished their purpose.

The attention which the Russians pay to editing the map projection, work which has as yet never been given its proper importance, should also be noted.

The Russian "Instructions" follow the customary Russian principle of drafting the map on a larger working scale (in this case, 1:350,000). Measurements of sheet border lines and type sizes to be used are also given for this scale.

Military Map and Survey Office, Warsaw

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I. GENERAL PRINCIPLES

A. Purpose of the Map

1. The 1:500,000 map represents the standard map of the USSR; it is intended to fulfil national economic and defense requirements and the needs of scientific and public organizations. It is the operational army map, and is intended also to serve aviation.

The 1:500,000 map forms the basis for the production of special maps; at the same time, it can be used extensively by economic offices and scientific research institutes. It serves in the preliminary planning of extensive, overall engineering projects by the state construction administration.

2. To fulfil its functions in accordance with these established requirements, the map must make possible:

a. Rapid orientation for ordering and carrying out operational assignments.

b. Effective planning for movement of large army units

3. In the production of the map close attention must be paid to:

a. Exact portrayal of the boundaries of the USSR

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b. Clear and careful portrayal and strict classification of the most important land and water communications

c. Portrayal of the principal watersheds which constitute natural barriers in clear and exact relief

d. Clear and impressive representation of physical features which are characteristic of a given area; panoramic representation of mountain ranges commanding heights, mountain crossings and passes, together with their approaches and valleys and flat terrain

e. Correct representation of wooded areas, important swamps, salt s and quicksands

f. Correct representation of inhabited places, taking into consider the importance and type of buildings, density of population, and subdivisions and giving prominence to places which are important for operational and orientational purposes, such as: large commercial centers; junctions; terminals; se ments at fords, mountain crossings, and passes.

g. Representation of important industrial installations and agricultural objects.

4. The production of a 1:500,000 map for areas which from a cartographic geodetic point of view have been little explored is to be permitted only as an exception directed by a dire need for it and only when a suitable earlier map available.

Sheets of the 1:500,000 map representing USSR territory which were produced from obsolete or unsubstantiated cartographic sources must be checked in the field or by the various local authorities.

B. Accuracy

5. Because the scale and variant cartographic sources make it impossible maintain a uniform standard of accuracy in the production of the map, the following rules are established:

a. The inner map borders, lines of latitude and longitude, fixed points and subdivisions into minutes must be drawn with graphic accuracy (0.2 mm).

b. On the "blueprints" (Blaudrucke) which have been prepared on the basis of reliable cartographic sources, features such as boundaries, fixed points heights, all orientation objects (churches, factories, monuments, etc.), cross roads, forest division paths, confluences of rivers, which are designated by lines, and other point-designated map elements must be drawn with graphic accuracy (0.2 mm).

All other features (rivers, roads, forests, swamps, etc.) may be generalized. In doing this the identifying characteristics of physical features must be preserved.

In case two features (e.g., a river and a road) are almost parallel the natural feature is shown exactly (in this example, the river); in the case of two man-made objects, the more important is shown accurately.

c. In order to enhance the appearance of physical features it is permissible to embellish their outer boundaries with accentuated markings.

6. Errors in measurement of the blueprints may not exceed ± 1.0 mm in case of uniform "deformation" [deformation] or ± 0.5 mm in cases of nonuniform deformation. Blueprints with major errors will be eliminated. Assembly of the blueprints will be carried out with accuracy of 0.3 mm.

(3) 500-2,000 inhabitants
(4) Under 500 inhabitants

c. Rural Settlements in Sparsely Settled Areas

(1) Over 2,000 inhabitants
(2) 500-2,000 inhabitants
(3) 100-500 inhabitants
(4) Under 100 inhabitants

Population will be indicated on the map by the size of the print. At the discretion of the editor, individual places which are important from a military-geographical point of view may be printed in type one to two points larger than would be indicated by the size of their populations. Similarly, in densely populated areas the type size for all places may be reduced by one-fourth.

16. It is recommended that the indicated classification be correlated with the density of population by using no more than six grades of population density; for densely populated areas the upper-range six grades of the scale would be used, for sparsely settled areas the lower-range six grades.

17. Classification according to political and administrative importance:

a. Capital cities of the member republics of the USSR and capital cities of foreign countries.

b. Capital cities of autonomous republics, krays, and oblasts not affiliated with a kray.

c. Capital cities of autonomous oblasts and of oblasts affiliated with a kray.

d. Capital cities of okrugs and national okrugs.

The political and administrative importance of places will be shown on the map by underlining the place names; however, the names of capital cities of the USSR and of member republics will not be underlined.

18. Political and administrative centers of foreign countries will be set off just as those of the USSR. The categories of political and administrative centers in foreign countries to be underlined will be established by the editorial plan for each individual country.

As a rule, the capital cities of larger political subdivisions (the provinces of China, the Aimak's of the Mongolian People's Republic, the Länder of Germany) will be placed on the same plane with the capital cities of the kray's. The capitals of smaller political subdivisions (the provinces of Korea, etc.) will be placed on the same plane with oblasts affiliated with a kray.

19. If the suburbs of a larger city are not shown on the map, their population shall be added to that of the city.

20. Population figures will be determined from available sources and corrected on the basis of the last census of the USSR or on the basis of reliable reports from proper authorities. In foreign areas, reference works will be used to determine population figures.

21. If population figures for a place are lacking but cartographic material showing the number of dwellings is available, the population figure shall be determined by allowing five persons for each dwelling.

22. The political and administrative importance of places in the USSR will be

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determined from the sources used for the projection of the map and from the latest edition of the handbook, Administrative and Territorial Divisions of the USSR. From this handbook it is also possible to get population figures for administrative centers of the USSR. (These figures are not revised annually, however.) When entering places on the map, it is absolutely necessary to take into consideration the most recent decisions and releases of the Presidium of the Supreme Soviet in regard to the political and administrative status of places.

25. On maps of sparsely settled regions all possible inhabited places will be shown, including individual farms, winter cabins, summer cabins, inhabited small plots of land (Parzellen), colonies of yurts in nomadic areas, and shepherd huts in the far north. In desert and steppe areas objects of orientational importance, such as pagan temples and burial places of saints, will be entered on the map.

24. Inhabited places must be entered systematically from important to secondary places according to these criteria:

a. Operative and orientation importance

b. Population and administrative importance

c. Cultural and economic importance

Communications Network

25. All railroads in operation and under construction, including cases where only the embankment (no rails laid) is being maintained, will be shown on the map. Proposed lines and those of only temporary importance will not be shown.

26. Classification of Railroads:

a. Wide gauge (single, double, and multiple track)
b. Narrow gauge

Electrified lines and lines under construction will be identified by special conventional signs.

27. All railroad junctions, stations, and sidings which are located at points of intersection with highways and waterways or on international boundaries will be entered on the map; these stations will be shown without regard to their exact location along the line concerned. All other stations and sidings will be entered with regard to the density of the communications network and with regard to space on the map. All railroad tunnels will be shown. If graphic material is lacking, stations may be entered on the map on the basis of regular railroad time tables.

28. Classification of Roads for Motor Transportation

a. Superhighways and main motor roads (in use and under construction)

b. Improved highways (asphalt, concrete, black-top, brick, 1st Class)

c. Ordinary highways (metaled, gravel, paving stone, 2d Class)

d. Country roads with regular maintenance (main roads, field roads, trails, 3d Class)

e. Ordinary country roads (4th Class)

29. All superhighways and improved highways will be entered on the map; other roads will be entered with regard to the density of the communications network and the peculiarities of the region.

In sparsely settled areas the map will show the following features in addition to country roads: in desert regions - caravan routes; in the forested regions of the taiga - forest trails (with the conventional sign for poor roads) and foot trails; in the far north, in very swampy regions and heavily forested regions - winter trails; in mountainous regions - foot trails and mule trails.

Classification of roads in foreign countries will be adapted in the editorial plan for each country to the conventional signs used for the USSR.

30. Bridges will not be shown on the map. Where bridges occur, the conventional signs used for the road and stream will intersect without a break.

31. Railroads, highways, and main roads will be carried to the map from cartographic sources, from data provided by military district offices, the People's Commissariat for Communications, the People's Commissariat for Motor Transport, and from other sources.

For roads which are represented schematically, an appropriate note will appear on the map margins.

Water Features.

32. Water features will be shown with regard to their dual significance as transportation routes and as boundaries and natural obstacles.

The navigable portions of rivers and canals will be shown in accentuated relief. Streams which would have a length of less than 1 cm on the map will be shown only in arid regions and in cases where they drain lakes. Only the larger drainage and irrigation canals will be shown.

33. All lakes with a map area of 2 mm square and more will be shown on the map. In arid regions smaller fresh-water lakes will be shown. In regions with clusters of small lakes, they will be represented so as to reproduce the characteristic peculiarities of the area.

34. River channels over 100 meters wide will be drawn on the map with double lines with shading strokes tending in a northwesterly direction.

In connection with rivers, the map will show ports, dams, sluices, ferries, rapids, and waterfalls; in sparsely settled regions fords and crossings will also be shown.

Regular steamship stopping places on the rivers will be designated with the conventional sign for ports. Termini for navigable portions (and for steamship navigability) of a river will be indicated by appropriate conventional signs.

35. Lakes, wells, and springs will be classified according to their waters, as being fresh, salt, or very salt.

36. In connection with important reservoirs and rivers, water levels will be indicated. Water levels will also be shown at confluences of rivers and above and below rapids in mountainous regions.

37. Other water features will be shown as indicated by the map's key of conventional signs.

38. When entering rivers and lakes, the maps and other sources of Narkomvod (People's Commissariat for Water Economy) and the Handbooks of the Water Sources of the USSR (publications of the State Hydrological Institute) are to be used.

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Terrain

39. Characteristic surface features, the most important sections, and commanding heights will be shown on the map.

Ground forms will be represented on the map by contour lines and by hachures. The southeasterly strokes of the hachures will be accentuated.

40. The contour interval will be 40 meters; where a more detailed representation of terrain is required, the interval will be 20 meters.

In hilly regions, the hilly teiga, and in mountain areas, the contour interval will be 100 meters. The even 100-meter contour lines will be drawn on all sheets, serving as rapid reference lines.

To facilitate terrain reading every fifth contour line will be accentuated.

Volcanoes, glaciers, moraines (on glaciers), cliffs, slopes, defiles, and spoil banks will be designated by appropriate conventional signs.

41. Heights of fixed points, commanding heights, and passes will be shown on the map.

Special symbols will be used for sands, "arc dunes" (Barchans), and dunes.

42. In cases where figures on depths of seas and large lakes are available, the depth-curve interval scale shall be as follows: 10, 20, 50, 100, 200, 500, 1,000 and multiples of 1,000 meters.

Boundaries

43. The national boundary of the USSR will be drawn with particular care on the basis of original survey records and by taking into consideration subsequent boundary-adjustment agreements. The correctness of the boundary line must be checked by the Military-Topographic Service (UVTS) of the General Staff of the Red Army.

Besides the national boundary of the USSR (including the Polar possessions of the USSR) the map will show:

a. Boundaries of the member Republics of the USSR

b. Boundaries of the autonomous Soviet Republics (ASSR's), krays, and oblasts

c. Boundaries of the oblasts and autonomous oblasts affiliated with krays

d. Boundaries of national okrugs and okrugs

44. The national boundaries of foreign countries will be represented by the same conventional sign as that of the USSR. Similarly, administrative subdivision boundaries in foreign countries will be represented by the same conventional sign as those within the USSR, as explained by the special instructions in the editorial plan.

45. A light violet line, 3.5-mm wide, will parallel the national boundary of the USSR. Color will not be used to indicate the boundaries of the SSR's, the ASSR's, autonomous regions, and smaller administrative units in the USSR or of administra-

tive subdivisions in foreign countries.

46. When entering the internal boundary lines, the most recently corrected maps of the administrative subdivisions, prepared by UGGK of the Main Administration for Geodesy and Cartography (GUGK) of the Council of People's Commissars (SNK) of the USSR and by local officials of GUGK, and releases of the Supreme Soviet of the USSR must be taken into consideration.

Ground Forms and Ground Cover

47. In connection with forests, tree species will not be shown; however, the principal dividing paths as well as larger clearings will be shown. As a rule, all forests and clearings which cover an area at least 0.25 cm square on the map will be shown. In the mixed wooded and steppe area, the scattered small forests (Kolki) will be represented by a special conventional sign. In barren areas, individual trees, which are important for orientation purposes, will be shown.

In the mixed wooded and tundra area, the tree clumps on the watersheds will be designated by the same conventional sign as those in the wooded and steppe area.

48. If more exact data for entering forests on the map is lacking, it is permissible to use available material in a smaller scale. If this is done, an appropriate note should appear on the margin and in the map log.

In entering forests on the map, the data of the People's Commissariat for Forest Industry (Narkomles) and of the forest industry research offices must also be consulted.

If forests have no clearly indicated boundary or if they are to be shown only approximately, the conventional sign shall be entered in lighter relief.

49. Bushy areas are to be shown only if they cover an area at least 2 cm square on the map; in barren regions or in individual cases of areas smaller than 2 cm square on the map, the editor will make the decision. Holoxylon (Saksaul) will be represented by the same conventional sign as bushy growths.

50. All marshes will be represented by the same conventional sign. Individual swamps, moors, etc., will be shown only if they cover an area at least 0.25 cm square on the map. In individual cases and in regions with clusters of small marshes, they will be represented so as to reproduce the characteristic peculiarities of the regions.

51. Sands (flat, hungy, wavy, dunes, and "arc dunes") will be shown if they cover an area not less than 1 cm square on the map.

52. Tundra, burnt-over forest, peat beds, orchards, reed growths, and river valleys will be designated by special conventional signs in all cases (except tundra) when they cover an area at least 0.25 cm square on the map.

53. Boundaries of forests, marshes, orchards, and moors are to be represented by dots. Boundaries of other ground forms and of other forms of vegetation are not to be drawn on the map.

Local Installations and Communications Installations

54. Local and communications installations will be represented on the map in relation to the population density of the region, as follows:

a. Installations which emphasize the economic identity of the region -

mines, shafts, other ore-producing installations, and oil-industry installations.

b. In foreign countries, in addition to these, the map will show air fields, fortifications, radio stations, high-tension lines, and submarine cables.

55. In sparsely settled areas the map will show, in addition to the above installations:

a. Communications installations: telephone and telegraph lines, post offices, and telegraph stations.

b. Important historical points and points important for orientational purposes: castles, towers, monasteries, churches, mosques, and, in general, all permanent structures as well as burial mounds, ruins, cemeteries, nomad graves, "Baburgans," "Obos," statues, and even boulders for orientational purposes; in steppe areas, also lone trees.

Inscription

56. Entered on the map will be

a. The names of all inhabited places

b. The names of seas, bays, straits, lakes, rivers, canals, mountain ranges, heights, passes, forests, large marshes (including salt marshes), large districts, deserts, extensive sandbars, capes, islands, and peninsulas

c. Descriptive names beside the conventional signs for: mines, mineral deposits, tractor stations (according to function and production), and possibilities for crossing bodies of water. (Descriptive names will not be entered beside the signs for springs, wells, winter cabins, railroad stations, railroad sidings, railroad shelters, and landings.)

d. Numerical figures for elevations of fixed points, characteristic terrain points, and water levels

e. The names of important wells and springs in arid regions

57. The orthography of place names will be determined from large-scale maps of the Military-Topographic Service (UVTS) and of the Main Administration for Geology and Cartography (GUGK); if these maps are lacking, the orthography will be determined by special decisions of UVTS and of the Transcription Bureau of GUGK. Geographical designations in the territories of the member republics will be transliterated into Russian. Foreign place names will likewise be transliterated into the Russian language.

Foreign designations for places, river, lakes, etc., which have different designations which have gained general usage in Russian speech and literature, will be shown in the latter manner, for example: Parizh (not Paris), Vena (not Wien), Rim (not Roma), Neapol (not Napoli), Genuya (not Dzhenova [sic]), etc.

Certain larger foreign places, which have been renamed, will be entered as follows: The new names will be entered as the principal names, the old names will be shown underneath in thinner print, for example, Lepaya (Libava). This form applies to places better known in the USSR by their former names.

E. Arrangement and Sequence of Operations

58. The following sequence of operations in production of the map will be adhered to.

a. Preliminary Operations

(1) Study of the area to be mapped

(2) Collection and study of literature and of cartographic and geodetic sources

(3) Determination of method of representation and coordination of various groups of basic material

(4) Preparation of the editorial plan

(5) Compilation (preparation) of the cartographic material

b. Assembly of the Map (preparation of the projection original)

(1) Construction and drawing in of the cartographic grid

(2) Computation and entering of even coordinates of fixed points

(3) Actual assembly of the map in the following order: shore lines of seas, water features (lakes and rivers), inhabited places, local installations, communications network, terrain, forests, and other map elements. Data from air photos will be entered on a light blueprint of the projection original after conclusion of all operations of projection. Inscriptions will be entered in final form after the communications network has been entered; the established type sizes will be adhered to.

In the preparation of the map the following will be used: blueprint drawings, pantographs, squared-paper drawings, and combinations of these. The method of projection will be determined by the editorial plan in relation to the kind of basic material.

(4) Correction of the projection original

(5) Final editing of the projection original

(NOTE: The log of a sheet must be prepared simultaneously with the enumerated operations.)

c. In the preparation of the map are included:

(1) Production of clear blueprints

(2) Final copy of reproduction originals

(3) Correction of reproduction originals

The map is now ready for printing.

F. Editing the Map

59. Editing is carried on during all operations. The work of the editor begins with a careful study of the area to be mapped. He directs the collection and study of literature excerpts and of cartographic sources, compares and approves all sources, selects the best among them, and gives directions for their use and adaptation. The editor concludes the preliminary operations by setting up his editorial plan. He is advised of all questions which arise during the preparation of the map by systematically supervising the work of all those engaged on the project. When the projection original has been completed, the editor reviews it, adding his remarks; when his suggestions have been carried out, the map goes into correction. If deficiencies in inscription, generalization, etc., turn up during the correcting process, these questions will be cleared up by consultation with the editor. Then the map is sent back to the cartographer for revision. Finally, the corrected and revised map is reviewed again by the editor. (This review will be not merely a superficial review of the sheet, but a systematic comparison of it with the sources.)

The editor bears full responsibility for the contents of the map. He also at all times supervises the preparation of final copy for printing. The editor pays particular attention to his choice of sources which determine boundaries, and also to the correctness and exactness of their representation on the map.

Upon completion of the correction process the projection original will be signed by the cartographer, corrector, division chief, and the editor.

60. Editing the map consists of:

a. Attaining sufficient coverage and correct evaluation of and selection from the cartographic sources to satisfy the requirements set for the map.

b. Providing full clarification of all questions arising during inscription of the map in regard to characteristic peculiarities of terrain.

c. Determining standards of generalization of map elements.

d. Establishing rules for transcription of names from a political and geographical point of view, and coordinating these transcriptions with maps in other scales, already issued or in process of production.

II. PRELIMINARY WORK

A. Area Study

61. The preliminary work begins with an intensive study of the area to be mapped on the basis of available literature and reference works as well as maps, cartograms, and other cartographic sources. In connection with this, military-geographical and topographical descriptions will be carefully studied. The stated types of material must be gathered by the editor in exhaustive quantity and studied in a thorough and critical manner.

62. Information to be gained from area study:

a. The military and economic importance of the area

b. The political and administrative subdivisions; density of population; importance, type, and character of inhabited places; new settlements; place-name changes; etc.

c. Terrain features and their characteristic peculiarities, such as: distribution and type of mountain ranges, hills, passes, valleys, etc.

d. Density and classification of land and water communications

e. Characteristic peculiarities and classification of ground cover and vegetation

f. Details regarding water features and their operative importance

g. Characteristic problems in transliterating geographic names into Russian

The editor will write a brief description of the area under study, dividing it into districts which are distinctive by reason of their natural, cultural and economic characteristics. He will mark the boundaries of these districts on a small-scale map and add a description of the identifying features of each circum-

scribed district.

The area description will be illustrated by sketches, showing the most outstanding characteristics of the area. In place of sketches schematic drawings (of water features, terrain, roads, etc.) are permissible. On the sketches or schematic drawings will be shown: the most important rivers, lakes, fords, watersheds, heights, passes, the communications network, large inhabited places, and extensive forests.

B. Selection and Evaluation of Cartographic Sources and Their Geodetic Bases

63. Cartographic sources include:

a. Catalogs and lists of fixed points and surface elements

b. Instrument, semi-instrument, and naked-eye surveys of surfaces and routes

c. Topographic and special charts

d. Exploration reports (for roadbuilding, soil conservation, etc.)

e. Descriptive literature, such as: military-geographical, physical-economic-geographical, military-historical, topographical, economic, statistical, and other descriptions; census data; handbooks of the rail and water transportation industries; handbooks of the administrative structure of the area, etc.

64. Depositories from which cartographic sources will be secured include the archives and technical libraries of institutions and offices engaged in topographical-geodetic research and charting work, as for example, the Administrations of the Military-Topographical Service and their subdivisions; the Main Administration for Geodesy and Cartography of the Council of People's Commissars of the USSR; the Main Geological Committee; the People's Commissariats for Agriculture, Forestry, and Communications; the Hydrographical Administration; the Geographical Society; the Academy of Sciences of the USSR; the Hydrological Institute; the Arctic Institute; and others.

65. Selection of cartographic materials will be carried out by the Division of Collection and Systematization of the Map Office in cooperation with the editor. The sources will either be requisitioned from the institution where located or be examined on the spot.

The cartographic sources will in good time be sorted according to an established plan, so that when map production begins, collection and selection will have been completed. As a rule, sources which are acquired after map assembly has begun, will be used only in exceptional cases. After the final copy of the editorial original has started, the use of additionally acquired sources is not permitted: they will be preserved for use when a new edition is issued.

66. Lists of the source material will be prepared, giving the following information for each item: name or designation, date of issue or edition, office or organization which prepared it, and the original sources on which the graphic document was based. These lists, when signed by the chief of the Division of Collection and Systematization, will be sent to the editor for study, evaluation, and decision as to their utilization.

67. All fixed points which will be entered on the map representing the western part of the USSR and neighboring countries up to the 90th meridian East Longitude must be computed on the Bessel Spheroid according to the Pulkovo System; all points east of the 90th meridian on the Bessel Spheroid according to the Svobodnyy System.

Triangulation points computed on other spheroids and according to other systems are to be corrected for coordinates, if these corrections exceed the standard of graphic accuracy ($\pm$ 0.2 mm) in the scale 1:500,000.

In the selection of trigonometric points, first and second-class triangulation points will receive preference, as will points determined by local objects. In the selection of astronomical points, those whose length has been established by radio or telegraph will receive preference. Astronomical points will be used, if trigonometric points are lacking or are insufficient in number.

68. Data dealing with elevation, as well as the accepted horizon and the standard of elevation determination will be correlated with the state water-level network (Nivellementnets) or with sea level.

69. In working through the cartographic sources the following will be established for each source: projection; geodetic basis; type, method, and year of preparation; degree of detail shown; and the method of representing the map elements. In ascertaining this information it is necessary to read all accompanying instructions, reports, and descriptions. Reliability of the sources will be determined by means of comparisons of sources, the reports of engineering and technical personnel engaged on the projects, and by obtaining the approval of persons well acquainted with the material.

70. The cartographic sources must represent their content in relation to fixed points.

71. The meaning of symbols on foreign maps will be determined and made to conform with the key of conventional signs to be used on the 1:500,000 map.

72. After working through all of the sources, they should be classified into three groups:

a. Basic sources

b. Supplementary sources

c. Auxiliary sources

The basic sources include fixed-point and cartographic maps, on the scale of 1:500,000 and larger, and all cartographic material which has a geodetic basis, such as instrument or semi-instrument surveys, exploration and research material, and maps based on topographic surveys. Also included are maps in current use containing lists of place names and population figures which are corrected periodically, and official reference works, which are the basic sources for entering the various elements on the map.

When sources providing the same coverage are available, the more recent will be preferred.

The supplementary sources include cartographic materials of specialized nature (scale 1:500,000 and larger), such as road, tourist, economic, administrative, forestry, geological, and soil maps. Map elements will be drawn from these sources if they can be proven absolutely reliable.

The auxiliary sources include all maps in smaller scale than 1:500,000, and the most recent descriptive works and reference books. On the basis of these sources map elements will be clarified as follows: roads will be classified more accurately; proper names of geographical objects (rivers, lakes, mountain ranges, districts, passes) will be corrected; terrain representation will be more clearly

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defined; the start of the river-navigation season will be determined; and elements missing in the basic sources, such as roads, paths, caravan routes, will be entered schematically.

73. Selection of sources and their systematic division into groups will be carried out in the following sequence:

First, the most reliable sources on the scale of 1:500,000 will be exploited. Only when sources on this scale are lacking or are unreliable may sources on larger scales be used, as a rule, however, not larger than 1:50,000.

Next, the cartographic materials with specialized contents and purposes will be exploited. Primary attention will be focused on individual objects, the reliability of their representation, and their current position. All differences in method of representation will be clarified.

Finally, those sources of the third group which in comparison with the basic sources are more recent and currently more reliable will be exploited.

C. Preparation of the Editorial Plan

74. The editorial plan will be set up by the editor for a series of sheets, scale 1:500,000, which are being prepared for issuance.

The editorial plan will be prepared in accordance with the instructions of this manual and in agreement with a pattern map chosen for the indicated area.

If a pattern sheet is lacking, then a proof sheet will be prepared. The editorial plan will be influenced by the characteristic physical-geographical and political-economic peculiarities of the area covered by the sheets, the nature of the source materials, and the method of their utilization.

The editorial plan will embrace all work performed by the editor prior to actual production of the map: area study, selection and evaluation of source materials, determining the method of using source materials, determining sequence of operations, determining entries to be made on the map, selecting elements to be emphasized, etc.

The editorial plan will be broad enough to fulfill all requirements set for the map.

On the basis of the plan for an entire area (series of sheets) the cartographers of the Map Division of VTB or the editor of the Map Division of GUGK will prepare editorial plans for each sheet. The latter will be approved by the division chief and presented to the division editor concerned for signature.

D. Program of the Editorial Plan

75. In summary, the editorial plan must provide for the following items in order to accomplish the scope of its program:

a. Name, function, scale and projection of the map

b. Headings for the individual sheets

c. Compilation of the source materials showing the following information: serial number, name, scale, projection, year when produced, evaluation, and directions for use

d. Lists of the descriptive sources with the following information: author, title, volume or edition, publisher, place and date of issue, chapters and pages, which material is to be used and for what purpose. (When descriptive sources contain contradictory information, the authoritative source must be determined.)

e. Determination of sequence of entries to be made on the map

f. Fixed points: approximate number to be entered in each trapezoid; sources (catalogs) in which they are to be found

g. Shore line: details regarding the characteristic peculiarities of the shore line and how to generalize it; the islands, bays, capes, etc., and the dredged waterways to be shown; cartographic and literature sources for representing them

h. Water features: the principal rivers and fords; navigable streams (if numerous, only references to literature sources need be indicated); list of rivers more than 100 meters wide; methods for generalizing rivers, lakes, swamps, salt marshes, and fresh-water springs in desert areas; cartographic and literature sources for representing them.

i. Terrain: important mountain ranges; level and hilly regions; characteristic terrain features of individual areas; contour intervals; directions for generalizing terrain features (examples to be given for special cases); directions in regard to base lines for elevation calculation; lists of the most important peaks, passes, and crossing places; sources for representing them

NOTE (i) When elevation figures are not given for foreign border areas, sources on the basis of which the hachuring of this terrain can be performed must be listed.

(ii) When it is necessary to represent terrain of operative importance, which is not adaptable to regular contour lines (terrain deeply cut by ravines or hilly terrain with small summits), these areas will be specially mentioned in the editorial plan and sources listed on the basis of which supplementary contour lines can be drawn. For depth curves the following information will be given: interval, number of depth figures to be shown, the most important sandbars, shoals, together with cartographic and literature sources for representing them.

j. Inhabited places: principles of selecting places for plotting and approximate number of places to be plotted in each area; list of areas in which all places will be plotted; new settlements and sources for plotting them; sources for ascertaining the political and administrative importance of places; classification of foreign political and administrative centers according to the pattern adopted for those of the USSR; sources for determining population figures

k. The communications network: directions for representing the road network and sequence of work; determining areas in which all railroad stations, sidings, and halting places are to be shown; determining areas in which distances between stations are to be shown (sources from which this information is to be drawn); lists of tunnels

l. Boundaries: determining the national and political and administrative subdivisional boundaries of the USSR and foreign countries; listing of sources on the basis of which this is to be done

m. Ground forms and ground cover: directions for their representation

n. Other elements of map content: directions as to how shafts, mines, installations, and other objects described in this manual are to be represented

o. Inscription: correction of the projection original; sources for transcription of place names (gazetteers and maps); directions in regard to places with alternate names and changed names

p. Final composition of the map: directions as to which map elements are to be emphasized, overprinted, or pasted on; number of blueprints on which the final copy is to be made; other details of perfecting the final draft

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III. PRODUCTION

A. Technical Methods of Production and Sequence of Operations

General Directions

76. For every sheet of the 1:500,000 map a special projection original in the map scale will be prepared.

77. The assembly of all map elements will be carried out on one projection original; the preparation of several projection originals showing varying numbers of map elements will not be permitted. The only exception to this rule will be: a special projection original will be prepared on which data for aviation purposes will be superimposed on the basic data.

78. To protect the projection original from distortion the geographical grid will be constructed on Whatman paper, which will be rigidly glued to an aluminum plate, 0.7-1.0 mm thick. The glued-on Whatman paper must be permitted to dry for at least 10 days.

The aluminum plate will be large enough to allow margins of at least 10 cm on the east and south sides and not less than 5 cm on the other sides.

79. The method of transferring map elements from the source material to the projection original will be determined by the editor in his editorial plan, taking into consideration scale, projection, inscription, accuracy, and method of generalization. In this work the following processes will be employed:

a. Phototypic process

b. "Mosh" process

c. Pantographic process

Phototypic Process

80. The phototypic process is the most suitable, simple, and accurate process to use in connection with fixed-point sources, in scale 1:5[illegible] or smaller, which have a cartographic grid and have been projected in a manner similar to that in which the 1:500,000 map will be projected.

Depending on the scale and content, the scale of the sources will be reduced photographically in either one or two stages to the scale of the projection original. If scale reduction is carried out in two stages, an intermediate scale is determined. As a rule, all sources in scale 1:84,000 and smaller will be reduced in one stage. If necessary, terrain features may be strengthened on the sources before the reduction process.

81. Sources in larger scale (but not larger than 1:42,000) will be reduced in two stages; the intermediate scale will be 1:200,000.

82. Besides the phototypic process, another process, consisting of copying map elements from large-scale sources on tracing paper, is permissible. This copy is then reduced to the production scale in one stage. When this method is used, small details are disregarded so that the drawing can be used repeatedly.

This process will be used in connection with valuable sources which exist in the archives only in limited copies.

83. These reduced light blueprints will be fitted onto the previously prepared geographical grid by fixed points.

If distortion on the blueprint is uneven, then the print will be cut in pieces, the size and number of pieces depending on the degree of distortion.

Superimposing the pieces on the projection original proceeds as follows: "T" cuts are made at the fixed points on the pieces in such a way that the points of the angles coincide with the fixed points. Then the fixed points on the blueprints are transferred to their correct position on the projection original; then the blueprints are glued down. When dry, the work of inscription will begin.

"Mesh" Process of Transferring Map Elements

84. The "mesh" process utilizing a mesh network will be an auxiliary method used especially when the sources consist of:

a. Semi-instrument or naked-eye route surveys which show a lack of uniformity in scale, so that a photographic process cannot be used.

b. Materials which have been produced in radically different projections from that required for the 1:500,000 map.

c. Materials in larger scale than 1:42,000.

This process consists in dividing the sources and the grid on the projection original into similar four-cornered or triangular meshes, the lines of which connect corresponding fixed points. Then, the situation of the source is carried to the projection original by freehand drawing.

The size of meshes on the projection original may not exceed 6 cm square, and the degree of accuracy described in section 5 must be observed.

Pantographic Process

85. The pantographic process is useful in reproducing small map segments and in cases where a photographic process is impossible because of the nature of the source material (for example, white line drawings on a blue background).

86. In practice, a combination of two or three of these processes will usually be used. Close attention must be paid to maintaining standards of uniformity on the projection original.

87. Preparation of the projection original will be carried out in the following sequence of operations:

a. Construction of the cartographic and coordinate grid

b. Plotting of fixed points

c. Drawing in the elements of map content

d. Editorial study and correction

B. Construction of the Cartographic and Coordinate Grid

88. The cartographic grid will be constructed with the help of the coordinate graph according to the tables of Professor Mavraiskiy for rectangular Gauss-Krüger coordinates and of a supplementary table (see Appendix 3).

89. The degree of accuracy to be attained must fulfil the following requirements:

a. The difference between the theoretical measurements and the measurements of the drawn side and diagonal lines may not exceed ± 0.2 mm.

b. The lengths of meridian sections cut by parallels must be equal,

c. The lengths cut by meridians along one and the same parallel must be equal.

d. The lengths of diagonals of trapezoids of the same geographical width must be equal, as must also the two diagonals of a single trapezoid.

After the correctness of the grid construction has been checked, the grid will be drawn in with India ink, the meridians and parallels numbered, and the designation of the sheet entered.

C. Entering the Fixed Points

90. The trigonometrical, polygonometrical, and astronomical points are basic to the assembly of the map.

91. The number of fixed points required for each sheet depends on the quality of the cartographic sources. Normally, each item will be fitted in according to three points. The grid will serve as an additional control. To complete a sheet, 40-60 fixed points will be required.

In case of an insufficient number of fixed points for fitting in the source material, graphic points determined from the most reliable sources will be used.

92. Fixed points will be entered according to their geographical or rectangular coordinates with an accuracy of ± 0.2 mm.

D. Assembly of the Elements of Map Content

General Principles

93. In the projection of the map, maps similar in scale to the map to be projected and which have been produced from primary sources in larger scale will be used. Only when such maps reveal inadequacies will recourse be taken to the primary sources.

94. In transferring map content from cartographic sources to the projection, the best sources will be used first, then the less reliable.

95. If cartographic sources are not provided with fixed points and a cartographic grid, then places, rivers, and other substantiated map elements will be used as reference points for transferring data.

96. Use of maps in scales smaller than 1:500,000 is permissible only in order to complete portions of the projection for which maps in the indicated scale are unavailable. If they are used, the terrain and water features transferred to the projection from them will be represented by special conventional signs and will be designated as approximations; in regard to other map elements so transferred, remarks will be made on the margins.

97. The projection original must be prepared with the greatest of care; inhabited places, water features, roads, terrain must be entered in accordance with conventional signs established for the map.

98. Names will be written in by hand and will be placed at the exact places to which they refer. Uniformity in size and character of script will be maintained. Pasting names on the projection original will not be permitted.

99. To facilitate readability and enhance appearance, the projection original will be inscribed in a variety of colors, as follows: inhabited places, local objects, country roads, and their names in black India ink; superhighways and highways in red; water features and their names in green; contour lines and their elevation figures in brown; forested areas in light violet; lakes and rivers (when represented by double lines) in light blue;

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salt and very salt lakes and marshes in violet.

100. In filling in map elements the rule will be to proceed from the more important to the less important. From each group of map elements the main objects will be entered first, then the secondary objects of that group.

Special attention must be paid to the generalization of outlines, which is to be carried out so that the characteristic peculiarities of the object generalized are set forth. All minor and unimportant details must be omitted.

101. In his work of assembling the map, the cartographer will at all times compare his inscriptions with all other issued maps. He will list all discrepancies and report them to the division chief, who will render a decision on the point at issue. The list of discrepancies will be incorporated into the glossary for the sheet as cross references to the accepted name or spelling.

If the cartographer discovers in the cartographic sources gross errors, mistakes, or inaccuracies in selection and position of various map elements, or inconsistency in inscription, he is duty bound to report these facts to his superior and to correct the logs of the sources at fault.

The supervisor and the Commissar of the office will report the errors so discovered in the sources to their superiors.

Inhabited Places

102. Inhabited places stretching out more than 1.5-2.0 km will be represented on the map by an outline symbol, smaller inhabited places by a small circle symbol. However, in sparsely settled areas the circle symbol will not be used.

Scattered places and individual farms will be represented by a solid square, of which as many may be entered as seems advisable in order to picture correctly the distribution of settlements in the area.

103. Inhabited places are entered on the map in order, from the most important to the least important. Entered first will be places located at crossroads, at crossings of important rivers, and at confluences of large rivers; then places having factories and plants, those located in areas having important natural resources, and others of cultural and economic importance will be entered.

Additional entries of inhabited places may be made, if necessary, and if space permits.

104. Large places plotted near the edge of a sheet will be shown in full. In such cases the border lines of the sheet will be broken so as to permit a complete representation of the place.

105. Names of inhabited places will be written horizontally and in positions least covered by contour lines, so that it is clearly indicated where the name belongs. As a rule, the names will be written to the right of the symbol. In cases where this procedure would cover up important contours, the names may be written to the left, below, or even, exceptionally, above the symbol. Names of scattered places or names which refer to a group of settlements may be written transversely, comprehensively, or letterspaced.

106. The descriptive names listed in section 56 will be entered in abbreviated form, according to an attached list of abbreviations (See Appendix 5). If the name of a place differs from that of a collective farm (kolkhoz) located there, the name of the place will be entered. If the settlement has no name, but the collective farm has a proper name, the latter will be entered. In this instance the designation "klkh." (kolkhoz) will be used only if connected with the name of a person (in the genitive case), for example: "klkh." im Molotova." In all other instances, the word "klkh." will be omitted; for

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example: kolkhoz "Krasnyy Partizan" will be written "Krasnyy Partizan." These same rules apply also to state farms (sovkhoz).

Dual designations for rural places will be entered only exceptionally. The editor will set up rules regarding such places. Dual designations are permissible only if the first name is not well known while the second possesses historical or literary significance. The second name will be entered 1.0 mm below the official name in thinner print and in print two-thirds the size of that used for the basic name.

If a larger settlement is located at the edges of two adjoining sheets, the inscription will be entered on the sheet showing the greater portion. On the other sheet the name will be written in thinner print of the same size and type, outside the border line of the sheet.

The names of railroad stations, sidings, and halting places will be entered with descriptive names, such as "st." (station) or "mes." (halting place). Names of stations, sidings, and halting places located near a place of the same name will not be shown.

Proper names and descriptive names of landing places (except in sparsely settled areas) will not be entered.

107. On maps of sparsely settled areas, the proper names (but not descriptive names) of winter cabins, summer cabins, nomads' huts, etc. will be shown. If they have no proper name, a descriptive designation will be used, such as: khure, dacha, pagan temple, etc.

108. Capitals of very small foreign countries, as Andorra, San Marino, Lichtenstein, etc., will be shown in smaller print.

Communications Network

109. Entries begin with the most important roads which connect the main inhabited places and which have operative importance. The less important will be entered in order. Simultaneously, generalizations will be undertaken. Curves, which are meaningless for the 1:500,000 map will be straightened, balanced, or exaggerated. The communications network will be drawn with special care, maintaining prescribed form and line thickness, so that road classes will stand out clearly and distinctly. When doubt arises as to classification, the editor will render a decision. This decision will be noted on the lower margin. During the preparation of the communications network special attention must be paid to the relationship which exists between inhabited places, rivers, railroad station, and other objects. When highways or railroads run off a sheet, a direction name is written at that point together with an arrow.

Railroads will pass through inhabited places in an unbroken line. In case curves or railroad lines or roads run beyond the sheet borders, then these segments outside the map borders will be connected with the main bodies by thin lines.

Water Features

110. Particular attention must be paid to showing the principal rivers in clear relief and to generalizing rivers and shore lines correctly. Characteristic outlines of all water surfaces must be faithfully reproduced.

The importance and size of rivers will be represented by the strength of lines used to represent them.

111. In order to picture correctly characteristic courses of rivers, lake shores, and sea shores it may be necessary to overemphasize relief lines which otherwise would not show up on a map in this scale. Examples: branches of large river deltas, narrow spits, groups of islands, or small lakes.

In generalizing the courses of rivers and lake shores, minor indentations will be omitted, if these omissions will not affect the characteristic appearance of these features.

112. In the course of work, ports, rapids, sluices, navigable portions of rivers and canals, shallows, sandbars, and submerged rocks will be entered. The directional flow of large rivers will be indicated, where this is not evident on the face of a sheet. Water-level figures will be shown.

Shores of seas, lakes, and rivers (which are represented by two lines) will be drawn with northwesterly lines of shading.

Intermittent streams will be represented by broken lines. Shore lines of lakes which tend to become dry during the dry season of the year will be represented as follows: high-water mark by a broken line, low-water mark by a solid line. The area between these two shore lines will not receive the color of the lake but will receive the conventional sign for a marsh (if a fresh-water lake) or for a salt marsh (if a salt lake).

Marshes and salt marshes will be drawn without boundary lines: the former with horizontal (on the projection original with green) strokes, the latter with vertical (violet) strokes.

113. Names of seas, bays, straits, gulfs, anchorages, large lakes, islands, peninsulas and extensive marsh areas will be inscribed within their boundaries in the direction of their longest axis.

If there is insufficient space within the limits of lakes and islands for their names, then the names will be written outside their limits, parallel with the northern or southern edges of the sheet and preferably on the right side. Names of rivers represented by double lines and of canals wide enough to accomodate the established type size will be written along the middle of their courses.

Names of other rivers and canals represented by double or single lines and of fords and straits will be written alongside and parallel to their courses. Care will be taken that the inscription does not cover the lines and that it be legible.

In the case of long rivers names will be written repeatedly along their courses; their names will always be given at their sources and mouths.

Names of small lakes and rivers will not be shown on the map. Water-level figures will be shown horizontally, preferably on the water surface. Wells and springs without names but having orientation importance will be indicated by the abbreviations "K." (well) and "Ist." (spring).

NOTE: In foreign areas and in the national areas of the USSR names of gulfs, bays, lakes, islands, rivers, etc., will be written according to local generic designations, for example: Lake "Yanlayarvi," Lake "Kokonselka," Lake "Ulankur," Lake "Sonkul," Lake "Hasensee," "Kamkadarya" River, "Karasu" River, "Khodzhalachai" (River) etc. (the local generic designation is combined with the proper name). Exceptions are permissible in cases of traditional usage (example: Amur-Darya); these will be written with a hyphen.

Terrain

114. Representation of terrain consists of entering the following details on the projection original:

a. Elevation of fixed points
b. Characteristic terrain points (commanding heights, lowest points of valleys, elevations of passes, etc.)

c. Contour lines, which reproduce ground forms

d. Conventional signs to represent characteristic terrain features, declivities, cliffs, and glaciers

e. Depth curves for seas and large lakes

f. Inscription of names of terrain features, their elevation figures and contour lines

115. Generalizing terrain during assembly of the projection original is especially difficult and responsible work. Simple mechanical reproduction of contour lines from the sources is unreliable. Taking into consideration the purpose of the map and the orographical scheme, generalization of terrain will be carried out so that the essential sections and ground forms will stand out in sharp relief. Such important features are: mountain ranges, watersheds, glaciers, hills, places difficult of access, passages, passes, etc. To accomplish sharp relief it is necessary to omit all minor and meaningless details and to draw contour lines which reproduce the actual characteristics of the terrain.

116. Generalization of terrain will be accomplished by eliminating unessential curves of contour lines. Geomorphological peculiarities of landscapes will be represented by standard contour lines; for example:

a. Level area - smooth contours

b. Area with many valleys and ravines - deeply indented contours

c. Hilly area - rounded contours

d. Rugged, mountainous area - jagged contours

e. Mountain ranges in which glaciers, cliffs, declivities, etc., abound - clear conventional signs to represent these features.

117. Special attention must be paid to correlating contour lines with water features. The following items must be noted:

a. The gradual narrowing of contour intervals along rivers, when natural and man-made obstacles, such as rapids, dams, etc., do not play a part (narrowing usually occurs upstream, from mouth to source).

b. The greater depth of the main river compared to its tributaries; therefore, the same contour line must, as a rule, run further upstream in the case of the main river than of the tributary.

c. Synchronized junction of the contour lines of both shores, especially in cases of high banks, which are not designated by conventional signs for declivities.

d. The correct representation of river valleys: as a rule, the contour lines must at first (from the mouth towards the source) run parallel to the river's course, then bend perpendicularly towards it, and then again run upstream along the shore lines.

e. The correct representation of valleys characterized by extensive ravines (contour lines must show these ravine formations by slight bends).

f. The correct representation of the slopes of meandering streams.

118. Clarity and expressiveness of terrain, through generalizing contour lines in harmony with the character of the landscape, will be accomplished: by eliminating meaningless contour lines, by coordinating and relating contour lines to each other and to water features, and by correctly selecting the principal morphological lines and summits of heights.

119. Simultaneously with the contours, lines of elevation [Höhenkoten] will be drawn. To facilitate reading the contour interval, these lines will be inscribed with elevation figures; the number of such inscriptions will depend on the nature of the terrain and the density of contour lines. In mountainous country each fifth contour line will be strengthened. In places difficult to read, hachures will be added to contour lines.

120. Names of mountain ranges will be inscribed along the axis of their ridges. For better legibility larger print may be used. Care must be taken that the inscription does not cover up important peaks and depressions.

Names of individual peaks will be written to their right, if possible. Names of passes and mountain crossings will be shown on the map together with elevation figures; in the absence of proper names, the abbreviations "per" for crossings, and "g. pr." for passes will be used, and elevation figures shown. For fixed points only elevation figures will be entered. The names of the most important commanding heights (highest points of mountain ranges and other elevations) will be written in print one-third larger than that used for other heights.

121. For better expression and greater clarity of the terrain picture, hachures will be added to the map. This will be done on a light blueprint produced by phototypic process on Whatman paper from the projection original. To prevent distortion the Whatman paper will be glued on an aluminum plate.

In mountainous areas where contour lines on the 1:500,000 map are concentrated and readily reproduce the terrain (mountain ranges, peaks, etc.), hachuring will be carried out in accordance with the contours. However, contour lines at 40-meter intervals do not clearly represent level and rolling terrain; it is necessary to refer to maps on which the contour intervals are smaller than 40 meters (10 and 20 meters). From such maps terrain elements can be recognized more clearly and auxiliary contour lines for hachuring purposes drawn (these auxiliary contours will not appear on the completed map). Hachuring should not be done on the basis of a single contour line until research has shown that a terrain change really exists. Cartographic sources showing terrain in relief (hachured or colored) should be used for hachuring purposes of the 1:500,000 map only if they appear reliable.

Hachures will be drawn vertically and strengthened on the southeastern slopes. To show gentle slopes hachures must be closely drawn and tend from darker to lighter tones.

122. If source maps of foreign border areas do not have contour lines and only hachured maps are available, then elevations of fixed points and elevation data secured from descriptive literature will be entered on the source material. Hereupon, contour lines will be drawn on proof sheets of these sources. Finally, the proof sheets are reduced to the scale 1:500,000 and incorporated into the projection original.

123. If no sources representing terrain by means of contour lines or hachures are available, then terrain representation on the map may be carried out simply on the basis of elevation data. The latter will then be entered directly on the projection original according to geographical coordinates on the basic sketch.

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Then follows hachuring of the terrain.

124. Drawing of contour lines must begin in regions best provided with contour lines. Terrain constructed only on the basis of hachures or elevation data will be shown on the 1:500,000 map only by approximated hachures.

Boundaries, Forests, and Other Cartographic Elements

125. In drawing state boundaries which run along rivers designated on the 1:500,000 map by a single line, the following principles will apply:

a. If the boundary runs along the channel, it will be drawn alternately on one then on the other side of the river.

b. If the river belongs to a state, the boundary will be shown on the territory of the neighboring state.

In drawing state boundaries which run along rivers designated by two lines, attention must be paid to representing the true situation. Special attention must be directed to exact drawing of state boundaries.

126. In entering state boundaries on the projection original the following is to be noted:

a. In open country the boundary line will be continuous. If it runs along roads, rivers, canals, etc., it will be shown on the map only at points where it bends sharply, at minimum intervals of 4-6 cm, and by means of groups of three or four conventional sign symbols.

b. When boundaries in two different categories coincide, the boundary in the higher category will be shown.

c. In connection with a contour line, the boundary will be shown on the side of the contour where it actually runs.

127. The boundary of a forest will be shown on the projection original in India ink by means of punctation. Generalization of a forest boundary will be carried out by taking into consideration the nature of the forests of that area.

128. Other landscape objects will be drawn by strict adherence to size and form of conventional signs.

Marginal Content of the Sheet

129. Above the northern outer border the following will appear:

a. In the center - "General Staff of the Red Army" (GSRKA), or "Main Administration for Geodesy and Cartography of the Council of Peoples' Commissars of the USSR," and the name of the most important geographical object.

b. On the left - the name of the Union Republic (abbreviated) and the Oblasts and Autonomous Republics, for example, "RSFSR, Leningrad and Kalinin Oblasts."

c. On the right - the sheet designation.

130. Below the southern outer border will be shown:

a. On the left - the name of the editor in chief and below, the date of issue.

b. In the center - representative fraction scale, linear scale, and remarks regarding declination; to the right - a sketch of administrative division, to the left - index of adjoining sheets.

c. On the right will be written: The map has been produced in Gauss-Kriger Projection for .... Month 19....

d. On the projection original the following will also be shown:

Produced by.....
Corrected by.....
Inscribed by.....
Chief..... Division
Editor.....
Office Chief.....
Military Commissar.....

In the case of the Main Administration for Geodesy and Cartography, "Work Group Chief" will be substituted for "Office Chief."

e. The table of conventional signs will appear on the left.

f. On the projection original, a sketch indicating border and diagonal measurements of the map sheets (in blue) will also be shown.

For examples of marginal content, see Appendix 6.

Junctions of Adjoining Map Sheets

131. Sheets are joined by drawing the junction on tracing paper and transferring it to the adjoining sheet with the aid of a ruler and triangle.

132. Sheets are joined by the cartographer; in cases of considerable discrepancies, decisions are made by the office chief.

133. A remark will be made on the margin of the projection original regarding junctions. The remark must state the date and sheet designation of the original (or reprint) of the 1:500,000 sheet with which the junction was compared, the date, month, and year of junction, and the name of the person who performed the work. Example: Joined with projection original (or reprint) K-35-C UVTS (Main Administration of Military-Topographical Service), 1936. 21/XI. 1938, cartographer Ivanov.

134. When adjoining sheets (projected or issued) are missing, the matter of junction can be considered disposed of only on direct order of the chief of UVTS. When junction with an adjoining sheet cannot be carried out because the sheet is outdated or unreliable, the question will be referred to the chief of UVTS for decision.

135. A junction will be checked by the corrector and approved by the office chief. After checking the junction, the corrector will sign his name on the margin. Example: "Junction checked, 19.1.1939, cartographer Petrov."

E. Correction of the Projection Original

136. Upon completion of the projection the cartographer will sign the original, the division chief (for the Main Administration for Geodesy and Cartography, the editor) will review it, and if he considers its assembly complete, will send it to the corrector.

The map corrector is responsible for the checking of:

a. The correct assembly and junction of all cartographic sources.

b. The accuracy of the projection, correct transfer and entering of all elements from the sources to the projection original, conscientious observance of all prescribed regulations and directions of the editorial plan. The corrector will also note all errors in generalization and inscription.

c. Junctions of adjoining sheets.

d. Marginal content of the projection original.

e. Correct compilation of map log.

137. The corrector will write all his corrections on tracing paper, which will be laid over the map sheet under correction; he will discuss these with the division chief (editor); then, he will forward them to the cartographer for entry on the sheet. In case of numerous corrections, the cartographer will be instructed to do the sheet over.

138. After effect has been given to his criticisms, the corrector will recheck the corrections made.

The corrected and reviewed original will be signed by the corrector and by the division chief (by the latter, after he has spot-checked the work of the corrector). The original then will reach the editor for review.

The corrector is equally responsible with the cartographer for errors and inaccuracies which he is obligated to detect (as enumerated above).

F. Cartographic Field Work

139. When necessary (when insufficient or no cartographic source material is available), field work will precede production of the 1:500,000 map. This work will be carried out in accordance with instructions of the chiefs of UVNS and GUGK.

IV. PREPARATION OF THE MAP FOR PUBLICATION

A. Drafting the Reproduction Originals

140. The reproduction originals will be drafted out on 1:350,000 blueprints. A reproduction of the projection original on Whatman paper, affixed to a hard base, will be used.

141. As a rule, all map elements, except forest area detail and data for aviation purposes, will be incorporated on one original. Only in case of a complicated situation or terrain is it permissible to make two originals; in such a case, water features and terrain will be represented on one original, ground forms, communications network, inscriptions, etc., on the other.

142. Before the work of filling in is begun, the measurements of the sides of the trapezoids on the blueprints will be checked. The following margin of errors between actual and theoretical measurements will be permissible:

a. In cases of uniform deformation, ± 1.0 mm

b. In cases of non-uniform deformation, ± 0.3 mm

143. In drafting the reproduction originals, the following must be observed:

a. Drafting is to be done with freshly mixed China ink with a small admixture of gamboge.

b. All map elements must be drawn in accordance with the table of conventional signs; no deviations from the projection original are permissible.

c. All lines on the reproduction original must be sharp and distinct.

d. When the map is prepared on the basis of more than one blueprint, it is absolutely necessary that the correct relationship of elements be maintained.

144. In representing terrain attention must be paid to maintaining sharp, full, and uniform contour lines.

145. Representation of forests will be carried out on a light blueprint by filling in the wooded areas with China ink on Whatman paper; when rivers and roads passing through forested areas are represented by double lines, the area between the lines must be left blank.

146. Inscriptions will be carried out by pasting printed labels on the reproduction original. These labels must be clean, well made, and printed on white paper. Care must be taken not to cover up railroad lines and highways. Inscriptions of contour lines will be pasted on the reproduction original of terrain.

147. For the regular edition of the map, hachuring of terrain will not be done on paper but on the blueprint by means of lithographic chalk on a grained lithographic stone. (If specialists for this method of hachuring are not available, hachuring will be carried out on a Whatman paper, followed by photoengraving according to the Duplex Method.)

148. In drawing in the elements of the map the following sequence will be followed:

a. Fixed points

b. Inhabited places and individual objects

c. Roads with crossings

d. Water features

e. Boundaries

f. Terrain

g. Other map elements

h. Borders

i. Pasting on of inscriptions and marginal content

B. Correcting the Reproduction Originals

149. Correction of the reproduction originals includes obtaining the following:

a. Completeness and accuracy of all map elements not fully developed the projection original

b. Accurate representation according to established conventional signs

c. Quality of drafting work

d. Utility of the prepared blueprints for making the printing forms (cuts) by phototypic process.

150. Corrections will be written on tracing paper. Special attention must be paid to the correctness of junctions with adjoining sheets.

151. Upon completion of the correction work and after criticisms have been attended to, the corrector rechecks the net result, signs the reproduction originals, and sends them to the division chief for review. He, in turn, sends them on for the production of combined copies, so that the correct relationship of map elements can be checked.

152. After the relationship of map elements has been checked, the map is signed by the division chief and by the Commissars of the office and released for printing.

C. The Map Log (Kartenkarteiheft)

153. Simultaneously with editing, projection, and final copy, a log will be kept for each sheet. Its purpose is to present a comprehensive picture of operations in the preparation of the map, to record type and quality of source material, to describe procedure, to explain how problems were solved, etc. The log thus serves as a guide in judging the reliability of a sheet.

154. The log must contain the following information:

a. General

(1) Map name and sheet number (designation)

(2) Scales of edition, projection, and fair drawing

(3) Kind of projection, base meridian, system according to which fixed points were computed

(4) Degree intervals of parallels and meridians

(5) Length and width of sheet in degrees; measurements of margins, sides, and diagonals of the sheet

(6) Enumeration of map element groups (inhabited places, water features, terrain, forests, boundaries, local objects)

(7) Colors used on the map

(8) Authorizations for projection, preparation, and issue of map (dates of approval by chief of UVKS)

(9) Where the projection original was assembled; who edited the map and set up the editorial plan; who projected the sheet and set up the editorial plan for the projection; who corrected the projection original; who made the indicated corrections; who worked out the final form of the map and who corrected it; the division chief; the division chief for collection and classification of source materials; the office chief (date when he approved the final form of the map; date when it was released for printing); the office Commissar. (Dates for beginning and end of all operations are to be recorded.)

(10) List of appendices in the log

b. Editorial Plan of the Sheet

The editorial plan will be written by the cartographer (for GUUK projects, by the editor) before work begins on the projection on the basis of the authorization and the general editorial plan. It will include additional details suggested by the peculiarities of the area covered by the sheet. The general principles of the editorial plan will not be repeated.

It will be approved by the division chief and the editor before beginning of projection work.

The following will be added to the projection editorial plan (in the form of a special appendix in the log):

(1) List and summary sheet of survey and cartographical sources used for projection of the sheet

(2) List of fixed points (with outline map)

(3) List of descriptive literature sources

(4) List of reference works

(5) Editorial guide card and the correction sheets

NOTE (i) The lists of sources must contain all sources intended for use in projection. If later some of these could not be obtained or were not actually used, notations to that effect will be made. Each source listed will be briefly described.

(ii) In the summary sheet of cartographical sources and fixed points, only those which were actually used for projection will be recorded.

c. Map Projection

In this part all operations of projection will be described by the person performing the work. He will describe:

(1) His preliminary work

(2) Entering of the borders and grid

(3) Entering of the fixed points

(4) Entering of the shore line and water features

(5) Representation of terrain

(6) Entering of inhabited places, communications network, and other elements

(7) By whom and on what basis names were transcribed and what changes were made in transcription

Each point, (1) through (7), will have columns relating the following:

(1) Dates of beginning and end of operations (names of assistants, if any, who performed the actual work)

(2) Basic sources, and what was actually extracted from them

(3) Critical evaluation of sources; contradictions and errors noted; how source materials (and points) were fitted in

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(4) Methods of utilization

(5) Remarks

At the close of this section of the log, the person performing the will write a summary report, which will make possible an evaluation of the entire sheet. The corrector of the projection original, the group and division chiefs, the editor, and office chief will also add their remarks.

d. Preparation of the Draft

The following items will be noted: results of review of the measurements of border lines on the blueprints prepared for fair drawings; methods used in entering names and in pasting them on; names of cartographers who drew the reproduction originals; remarks of the corrector, group chief, and division chief; remarks of the editor and office chief.

155. The log written up by hand during the course of all operations is the document which pictures the sum total of work performed during production of the map. After completion of all sheets the contents of these handwritten logs will be combined into a volume, which will be kept in the office; the originals of the logs, as well as all map originals, will be forwarded to the central archives.

V. PUBLISHING THE MAP

A. General

156. The map will be printed in nine colors.

a. Black: ground forms, sandy areas, steamship lines, inscriptions

b. Blue: shores of seas and lakes, rivers, marshes, glaciers, and wells

c. Brown: contour lines

d. Violet: very salt and salt-water features, salt marshes, national boundaries

e. Light blue: seas, lakes, and rivers represented by double lines

f. Brown (different shade than contours): hachuring of terrain

g. Red: highways

h. Green: forests

i. Red: data for aviation purposes

B. Preparation and Correction of Negatives, Cuts, and Combined Proofs

157. One-color negatives will be produced by covering up map elements in other colors. From these negatives cuts will be prepared. Deviation of map border measurements on the negatives and cuts from theoretical measurements may not exceed 0.3 mm; in case of greater deviation, the work will be done over.

158. Every cut will be corrected by comparison with the original for errors resulting during the process of producing one-color negatives as well as for technical inadequacies.

159. Upon completion of all correction work, the cuts will receive final etching.

and then the first combined proof will be prepared. The proof will be corrected by comparison with the original. Attention must be paid to cut corrections and to the fitting together of terrain, boundaries, and water features. Engraving improvements will then be carried out.

160. From the corrected cuts, a second proof will be prepared in color according to the prescribed plan.

If color combinations are correct, the second proof will be accepted as the official one, and the editor will declare it ready for printing.

161. If a sheet is issued with hachuring of terrain, a photoengraving will be made from the approved hachure original, a cut prepared, and a combined proof in all colors produced.

161. The official proof, declared by the editor as ready for printing, will serve as a pattern with which printed copies of the map sheet will be compared.

Appendix 7. ENTERING DATA FOR AVIATION PURPOSES

1. Data for aviation purposes which is to be entered on the map includes: isagons, expanded numbering of meridians and parallels, and their subdivision into tenths of a degree.

Isagons will be entered according to charts of magnetic variation of the Main Geophysical Observatory in Leningrad. Such a chart in the latest edition must be on hand at all times in the files of every office.

Isagons will be entered for each degree of magnetic variation and will be entered at the sides as well as in the center (if the isagon is longer than 25 cm) of a sheet, and marked in degrees and minutes with appropriate plus or minus sign.

2. In the center of each one-half-degree section of the parallels, latitude will be noted; in the center of each meridian section, longitude from Greenwich. Greenwich time will be accepted as $0^{h}0^{m}$. When a meridian leaves the border of a sheet, longitude will be entered in a square.

3. All data for aviation purposes will be entered on a light blue print of the reproduction original in pencil and finally drawn later by the draftsman who pastes on the inscriptions.

4. When entering the data for aviation purposes on a sheet, care must be taken that these entries do not cover up important map details and do not impair the map's readability. If necessary, figures can be placed to the right or left of center of sections where they belong.

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